On the benefits of specialized settings for deaf and hard of hearing students in computing

Jane G. Stout
Computing Research Association (CRA)
Center for Evaluating the Research Pipeline (CERP)
Washington D.C., U.S.A.

Abstract—Deaf and hard of hearing (DHH) students face barriers to communication and comprehension in typical education settings. The current study found that DHH computing students enrolled at institutions that specialize in DHH accessibility have greater access to mentorship, stronger self-efficacy in their computing ability, and a greater sense of belonging in the computing community compared to DHH students enrolled at non-specialized institutions. These findings suggest that DHH students are likely to thrive in computing programs within institutions that identify as DHH accessible.

Keywords—accessibility; special needs; institutional support; self-conceptions; diversity

I. INTRODUCTION

Deaf and hard of hearing (DHH) students face a number of barriers to achievement in education settings as a function of their special needs regarding communication and comprehension. In the hearing world, DHH students typically lack access to trained professionals to facilitate achievement [1]. By extension, this suggests that DHH computing students lack access to mentors, which is particularly important for people who are in the minority within organizations e.g., [2]. The hearing world also often has low performance expectations of DHH students, which is rooted in a lack of exposure to successful DHH students [1]. Accordingly, DHH students tend to have low self-esteem in learning environments that are unaccustomed to serving students with special needs [3]. This is important because positive perceptions of one’s self-worth and ability in academic settings are critical to persistence and achievement [4]. Finally, in the hearing world, DHH students lack access to peers and role models who are “like them”, a sense that they are understood by others, and a feeling that they “belong” [1]. Importantly, feeling a secure sense of belonging is a strong positive predictor of academic engagement and persistence [5].

Given the hearing world’s limited ability to provide mentorship, support for intellectual enrichment, and social connectedness for DHH students, DHH computing students may experience optimal academic and career preparation at institutions that are strongly committed to providing strong support and full inclusion for DHH students. In the current work, I label these types of institutions as “specialty institutions”, and assess whether DHH students majoring in computing at specialty institutions are more likely to have (a) a mentor, (b) higher computing self-efficacy, and (c) a stronger sense of belonging in the computing community than DHH students majoring in computing at non-specialized institutions. Importantly, I also include a sample of hearing students as a comparison group against which both groups of DHH students’ access to mentors and subjective experiences are compared.

II. METHOD

A. Participants

Thirty-five undergraduate students who self-identified as DHH (n = 18 at Non-Specialized Institutions; n = 17 at Specialized Institutions), and 20 self-identified hearing students participated in the current study in exchange for being entered into a raffle to win a $100 gift card. All students in the sample reported that they were majoring in a computing field. Of note, the distribution of students’ gender, race/ethnicity, and academic year did not differ across institution type (e.g., the proportion of women was statistically equivalent across all three comparison groups). This is important, given the fact that students’ access to mentors, self-efficacy, and sense of belonging tend to be lower among students who belong to underrepresented groups (e.g., women in computing fields; see [7]) and students who have had less time to development mentor/mentee relationships as well as their computing identity (i.e., first and second year students). Thus, students across comparison groups were similar on a number of dimensions that might otherwise explain their access to mentors and subjective experiences in computing.

This research is sponsored by two grants from the National Science Foundation awarded to the Computing Research Association: CNS-1246649 and DUE-1431112.
B. Procedure

Students were invited to complete an online survey sent to a national sample of colleges and universities during the fall 2014 academic semester. Embedded within the survey were questions pertaining to access to mentorship, self-efficacy, and belonging.

1) Mentorship. Students were asked Who do you go to most often for career advice and assistance? and were to select one person from the following: No one; A professor within my department; A professor at my college/university who is outside of my department; An individual I met through a formal mentoring program sponsored by an outside organization; or Someone else.

2) Self-efficacy. Students responded to seven questions assessing self-efficacy (e.g., I am confident that I can quickly learn a new programming language on my own) using a scale ranging from (1) strongly disagree to (5) strongly agree. Items had good internal reliability (α = .84; [8]), so were averaged to create a composite measure.

3) Belonging. Four items were used to assess belonging (e.g., I feel welcomed in the computing community), using a scale ranging from (1) strongly disagree to (5) strongly agree. Items had good internal reliability (α = .69), so were averaged to create a composite measure.

III. RESULTS AND DISCUSSION

See Table 1 for descriptive statistics for the analyses that follow.

<table>
<thead>
<tr>
<th></th>
<th>Has &quot;no one&quot; as a mentor</th>
<th>Self-Efficacy, High</th>
<th>Belonging, High</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>DHH NSI, (n = 18)</td>
<td>45% a</td>
<td>3.33 a</td>
<td>0.59</td>
</tr>
<tr>
<td>DHH SI, (n = 17)</td>
<td>12% b</td>
<td>3.87 b</td>
<td>0.88</td>
</tr>
<tr>
<td>Hearing, (n = 20)</td>
<td>15% b</td>
<td>3.99 b</td>
<td>0.68</td>
</tr>
</tbody>
</table>

Note. M = Mean; SD = Standard Deviation; NSI = Non-Specialized Institution; SI = Specialized Institution. Subscripts that differ within columns indicate a statistically significant difference, p ≤ .05.

ACKNOWLEDGMENT

I wish to thank Richard Ladner, Professor of Computer Science at the University of Washington; Mohammad Obiedat, Professor of Mathematics and Computer Science at Gallaudet University, and Andrew Sears, Dean of the College of Information Sciences and Technology, Penn State University for their valuable input concerning DHH students’ needs, and specialized institutions’ infrastructure. I thank CERP Research Analysts, Ama Nyame-Mensah and Heather Wright, for countless hours of data collection and data cleaning. Finally, I thank the computing departments involved in data collection for this paper (a list of participating departments can be found here: http://cra.org/cep/our-buddies/list-of-data-buddies).

REFERENCES


